RAILWAY ENGINEERING
and Maintenance of Way

PUBLISHED BY THE
BRUCE V. CRANDALL COMPANY, CHICAGO

Office of Publication, Rooms 409-410 Security Building,
Cor. Madison St. and Fifth Ave., Chicago

TELEPHONE MAIN 3185.

Eastern Office: Room 714, 132 Nassau Street, New York City

Entered as Second-Class Matter April 13, 1905, at the Post Office at Chicago, Illinois, Under the Act of Congress of March 3, 1879.

A Monthly Railway Journal

Devoted to the interests of railway engineering, maintenance of way, bridges and buildings.
Communications on any topic suitable to our columns are solicited.
Subscription price, $1.00 a year; to foreign countries, $1.50, free of postage. Single copies, 10 cents. Advertising rates given on application to the office, by mail or in person.
In remitting make all checks payable to the Bruce V. Crandall Company.
Papers should reach subscribers by the twentieth of the month at the latest. Kindly notify us at once of any delay or failure to receive any issue and another copy will be very gladly sent.

Vol. 1. CHICAGO, JUNE, 1905. No. 3.

THE seventh International Railway Congress has finished its labors at Washington and the results are in the archives of that illustrious body. This being the first meeting of the body in the United States, the American Railway Association became the host, and the thorough and complete manner in which the visitors were entertained has left an impression of regal splendor rather than republican simplicity; the foreign contingent will leave for home with high ideals of Yankee hospitality. A more representative body of railway men never before met in convention, and its work from the opening on May 3, to its close on May 13, was characterized by the most intelligent consideration of every branch of railroading, by which each contingent of the body comes closer in touch with the other.

Social amenities were not the least of the attractive features of the occasion, the plans for the entertainment of the delegates being of the most comprehensive kind, and these were supplemented by the citizens of Washington so well that not a waking moment was without enjoyment to the visitors; and only those who have felt the warm welcome of the people of that beautiful city can understand what it means. Old landmarks dating from the birth of the Nation, furnished sights highly instructive, as well as replete with pleasure.

The work of the delegates will be reflected in future railway practice here and abroad, in the betterment of all essentials of progressive railroading, and will work wonders in breaking through that crust of conservatism, the tendency of which is to stifle rather than broaden the understanding. The eighth congress, it is proposed by the permanent commission, to be held in Switzerland in 1910, which will be the twenty-fifth anniversary of the founding of the institution.

Maintenance of Way

THE work going on in the various railway engineering organizations looking to higher standards and improved methods in maintaining the properties all are interested in and for the integrity of which they are responsible, has left its impress on constructive details to the extent that anything to receive consideration must have the endorsement of the highest talent in their respective professions. This is especially true of those whose functions are purely exercised in the maintenance of way, and properly so, for they are engaged in not only rearing the foundation—earth and bridge, which sustains our traffic, but must see to it that its integrity is preserved at a reasonable cost, and this explains the attention given to the multiplicity of details entering into the completed fabric.

A roadbed of durability is of course a first consideration, and what constitutes such has long been a matter that has received the earnest attention of engineers. A paper read by E. K. Morse before the Engineers' Society of Western Pennsylvania contained some interesting particulars about material used for a fill, which was granulated cinder, and used at a steel mill with no appreciable settling in a strip of track of considerable length. This cinder as it comes from the furnace is passed over a jet of water and falls into a vat. It is of a light, fluffy character and will float on water. Its frailty is such that it will crush in the hand, and is so light that a dry cubic foot of it weighs but fifteen pounds, while its porosity is such that water passes through it. As the author of the paper stated, it would be thought about as poor material as could possibly be used for any kind of railroad construction, yet this stuff was put down to a depth of one foot just as it came from the furnace.

It must be understood that this material was used as a filler on a bridge that was decked over from truss to truss with steel plates which were covered with the cinder, on which was laid the ties, and rails in the usual way. The cinder was not packed, and the ties crushed into it, but the surfacing was not nearly what would be required on the ground, though the tonnage passed over it was of the heaviest. The crushing action of the tie into this cinder was greatly different from that in rock ballast, which makes a bearing wherever it touched, but with the cinder, the every inch furnished a perfect bearing. Low temperatures do not affect it, and it never gets hard, besides, ties have a longer life in the cinder than on the ground. While it seems that one of the requirements for the use of this material is, that it is

necessary to use a trough as a floor system, the action of a train on such a cinder bed is exactly the same as on the ground, with the rather remarkable exception that it rides smoother on the cinder, and the impact is greatly less than that encountered on the regular open floor system of ties and guards bolted down to the stringers. This engineer, after about five years of observation, has concluded to use cinder for the purpose noted. The fact that it costs money to produce it will militate against its general use as a rail foundation, but the fact remains that it has been found an ideal material for the purpose, and it may be possible that its valuable constituents may be found in a cheaper substance, which will enlarge its field of usefulness.

Reinforced Concrete.

IT is not generally known in this country that reinforced concrete has been in use since 1885, but such is the case, according to M. Kareischa, who is authority for the statement that such construction on the Monier system had been in use in Russia since the above date, and one of the latest instances of such construction there is the caissons for the piers of the bridges on the Trans-Manchurian, also the Balogoa-Sedletz Ry. It will not be without interest to the American engineer to know that such eminent names are appended to the unqualified endorsement of reinforced concrete, as those of Tolstopiatoff and Kupka, who report that: "Reinforced concrete has received many and important applications on railroads, both from the technical and economical points of view. It can fully and successfully compete with masonry and timber or steel construction." The above quotation is one of the conclusions adopted at the International Railway Congress, and it was supplemented by another one equally flattering to the new form of construction now so popular in this country, not only in railway work, but also in municipal and industrial engineering, as follows: "Tests of reinforced concrete structures, theoretical researches on the question, and the results of practice, justify the conclusion that such structures need not cause any apprehension, and that further extension is recommended to railway administrations."

In this connection, Mr. Elskes referred to experiments which he had made, which led to the conclusion that this form of construction should not have spans exceeding eight or ten meters when built to carry railroad tracks. Experience in Switzeland had shown that owing to limitations on roads in operation, the cost of reinforced concrete bridges may be higher than that of metal bridges, notwithstanding that reinforced concrete itself may be cheaper than metal. There was, however, an economic advantage if the cost of maintenance is considered. Mr. Rabut, who is a prominent authority on concrete construction by reason of the many examples of his handiwork, is of the belief that it might be wide of the mark to say that reinforced concrete is less economical first cost than metal, for causes due to operation of a road, citing the case of double-tracking a belt line in Paris, a work in which most serious obstructions were met and overcome by reinforced concrete. This work if done in metal would have cost far more, and was done in less time than would have been the case if of metal.

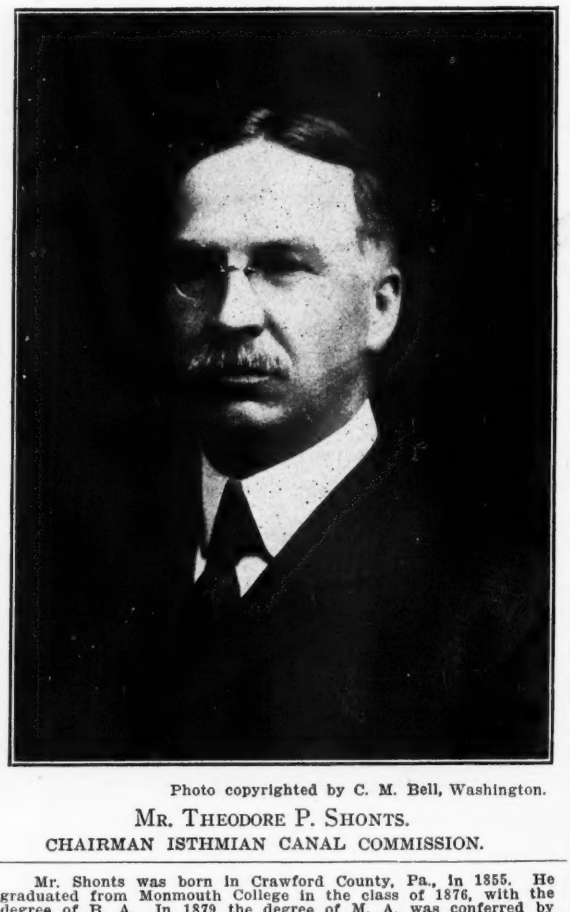


Photo copyrighted by C. M. Bell, Washington.

MR. THEODORE P. SHONTS.
CHAIRMAN ISTHMIAN CANAL COMMISSION.

Mr. Shonts was born in Crawford County, Pa., in 1855. He graduated from Monmouth College in the class of 1876, with the degree of B. A. In 1879 the degree of M. A. was conferred by the same college. He entered railway service in July, 1881, since which time he has been, consecutively, superintendent Iowa Construction Co. till May, 1882; May, 1882, to 1886, general superintendent Indiana, Illinois & Iowa Rd.; 1886 to 1898, general manager same road; 1898 to 1902, president same road; on January 15, 1904, he was chosen president of the Toledo, St. Louis & Western, and upon the organization of the new Isthmian Canal Commission, Mr. Shonts was chosen chairman.

As a result of the discussion at this meeting it was further concluded that: "Railroad practice shows that carefully built reinforced concrete structures give excellent service and require almost no maintenance. For this reason the use of reinforced concrete should be recommended even if the cost of construction should exceptionally, be higher than for another system of construction." And another and later conclusion adopted read as follows: "Reinforced concrete permits the rapid building of structures with readily obtained materials, and this avoids the necessity so trying in practice, to give special orders to shops." These conclusions will be regarded as in strict consonance with what has been found in the practice of this country, in the comparatively short time this form of construction has been in vogue, and they will appeal with force to those responsible for the maintenance of way.

The International Railway Congress

THE seventh session of the International Railway Congress opened at Washington, D. C., at 11 o'clock a. m., Wednesday, May 3, with an address of welcome by the vice-president of the United States, Fairbanks. The attendance was large, 35 countries being represented. The meeting was held in the large ball room of the new Willard Hotel and it was handsomely decorated with flags of the different countries represented. Mr. Ernest Gerard, of Belgium, acted for President Dubois, who was not present. He introduced Mr. Stuyvesant Fish, president of the American section of the International Railway Congress, who made an elaborate and interesting address in English. This address was then read in French by Mr. Edward Sauvage of Paris. President Fish, by consent, appointed Messrs. Weissenbruch and Allen temporary secretaries. Announcement was then made that the five secretaries would immediately meet in the room assigned them to organize.

The questions for discussion at the Congress covered all branches of railroading and each topic was assigned to its special section. Those matters which are of interest to the engineering department are reviewed in the following pages of this issue.

Under the general head of "Ways and Works" was taken up first, a study of the selection of kinds of wood and of the processes of preservation of railway sleepers or ties; second, cross-sections of heavier railways, manufacture and inspection, best metal to use for rails and ties, nickel alloys; rail joints; improvements in suspended joints, experiments with supported joints; experiments with a view to reducing number of joints; methods for preventing creeping, especially on double track lines and on steep gradients; third, improvements in rail crossings, spring frogs, movable point frogs and crossings and continuous rail crossings in which the gap at the throat of the frog is done away with which shall satisfy all the requirements of modern traffic and stand heavy locomotives being run over it at high speed without any shock; fourth, the use of concrete strengthened by the use of imbedded metal in railway works, comparison from the point of view of cost, of bridges of concrete strengthened by the use of imbedded metal, with those of metal.

Under the general head of "Working" was taken up up the question of what recent improvements have been made in automatic block-signaling apparatus, and what progress has been made in their introduction.

On May 4, the first day the sections met, mainly for the purpose of organization, and the discussion of reports and papers were not taken up until the second day, May 5.

Wooden Sleepers or Cross-Ties—Selection of Kinds of Woods and Processes of Preservation.

Mr. Munz made a summary of Mr. Hausser's report, which was printed in full in the Bulletin of the International Railway Congress for 1904 Vol,. XVIII., p. 885.

"1st. It is possible to use both hard woods and soft woods. The selection depends on individual conditions adopted.

"2nd. It is advisable to have strict specifications and to exercise great care in accepting sleepers. The timber yards where the sleepers are prepared must be kept clean and free from decaying matter; sleepers after cutting up must be stacked above the ground so as to allow free access of air, light and heat."

Mr. Muntz was of the opinion that special care should be taken with European woods; still, one should not be too rigorous in applying this rule, for there is a large worm in France which attacks the wood, rendering it unsuitable for building and joiner's work, but does not impair in the least its strength and durability for ties. Mr. Kruttschnitt agreed on this point and said these conditions existed in the case of Louisiana cypress.

Adopted, with the insertion of the word "reasonably" before the words "strict specifications."

"3rd. The pickling of sleepers in order to increase their life is to be generally recommended. The selection of the antiseptic and the method of carrying out the pickling operations depend on individual conditions."

Adopted.

"4th. Not covering up the sleepers does not reduce their life. If they are not covered up, it is possible to see any defect at once and if necessary remedy it immediately."

M. Bauchal asked for information on the practice followed in warm countries. M. Cartault was of the opinion that in warm countries it is preferable to cover the ties with a layer of about three to four inches of ballast. Mr. Ramsey holds a different opinion, and he said that in certain parts of the Southwest of the United Staes it is better to leave the ties uncovered, because the defects cannot be seen when the ties are covered, and also because it contributes to their deterioration. Mr. Dudley confirms this opinion as far as yellow pine ties are concerned, stating that they rot very rapidly on the inside when they are covered by fungus growth. In the state of New York the life of yellow pine ties may reach ten or twelve years, while in the south of the United States it will not exceed four or five years. On the Isthmus of Panama yellow pine ties cannot be expected to last more than eighteen months.

Mr. T. R. Hart mentions a railroad near the coast of the United States of Colombia, passing through a very marshy region, where he has conducted a very interesting series of experiments on the life of different woods used for ties. His observations prove that the woods of the United States when covered will last hardly two years, while when partially covered their life will extend from three and a half to five years. Lignum vitae, however, will last for ten years without showing any signs of rotting at any point except near the spikes. It is then necessary to bore a new hole for the spike because the wood is so hard that it is impossible to drive a spike in it in the usual way. This involves an additional expense but which, however, is more than compensated for by its prolonged life.

Mr. Cushing, speaking about the Southwest of the United States, thinks that it is better practice to leave the ends of the ties open, provided a covering of about three inches deep is laid on the middle portion of the tie. Mr. Kruttschnitt says that in the American desert, where little humidity and little rain is found, the question of covering or not covering the ties is of small importance as far as their life is concerned, and that it is evident that their life depends on the relative humidity to which they are exposed. M. Descubes says that since this can be resolved into a question of stability or preservation, and as the few inches of ballast on the ties can hardly be considered as adding to their stability, he is in favor of sacrificing their stability in order to prolong the life of the ties. One of the advantages of not covering the ties is the fact that all defects may easily be detected. Mr. Thompson, of the East Indies, thinks that in a warm and dry climate it may be more advantageous for the ballast to cover the ties, but that in warm and humid countries the ties should always be exposed to air and light. M. Muntz suggested, and it was admitted, that the fourth conclusion should be modified as follows: The uncovering of the ties does not appear to diminish the life of the wood, even for untreated timbers. In this way it is possible to detect without delay all defects which may occur, and apply, if possible, some

immediate remedy. In some special cases and especially in warm and dry countries, it may be useful to cover the timber with ballast.

Mr. Ingersoll asked for information whether ballast placed on the ties will interfere with the working of the electric signals. Mr. Kruttschnitt said that slag ballast and other porous materials, of whatever nature they may be, have interfered with the workings of the signals, but that modern improvements in the signal installation have practically remedied all these difficulties.

"5th. It is of the greatest importance to combine great strictness when accepting sleepers with great care in selecting the ballast; the latter must be permeable, must be capable of being well packed, and the packing well maintained, and give good adhesion between the sleeper and its seat. As far as this is concerned, the measures which are best for the preservation of the wood are also best for the stiffness of the track."

Adopted, substituting the word "important" for the words "of the greatest importance."

"6th. In order to prevent any contamination of the ballast, and at the same time help to preserve the sleepers, one cannot recommend too highly the careful drainage of the roadbed, in order to ensure that any water may run off properly."

Adopted.

The second session took up the discussion of the second conclusion of Mr. Kendrick's report, "Inspection and Preliminary Preparation Before Treatment."

Mr. Faulkner was of the opinion that two separate inspections of the ties are necessary, with an interval of several months between them.

Mr. Descubes stated that such a practice was followed by the Eastern Railway of France.

Mr. Faulkner presented a drawing, showing the different methods of stacking cross-ties for seasoning purposes; the stacks vary according to climatic conditions.

Mr. Cartault, of the Paris, Lyon & Mediterranean Company, explained that this railroad used two systems of procuring ties—some are bought in an untreated condition and others are bought already treated, but under a strict inspection, the inspectors examining all ties closely from the time they are cut to the moment of their final treatment. Messrs. Descubes and Cartault are both in favor of drying ties in the open air.

3. What Treatment Should Be Used?

Mr. Cartault stated that the railways of the Paris, Lyon & Mediterranean Company use creosote, and that thereby the life of an oak tie is increased to about 15 to 20 years, and that of a beech tie from 21 to 25 years. The ties are first subjected to a vacuum in a metal tube, and then the creosote is injected under a heavy pressure. In the treatment of oak cross-ties as much creosote is injected as they will hold, varying from 14 to 15 pounds per tie. With reference to beech ties, it is possible to inject between 45 and 50 pounds per tie. Creosote is an oil of tar containing from 10 to 25 per cent of naphthaline and 67 per cent of phenol. The cost of these cross-ties treated and ready for service is about $1.60 apiece and upward.

Prof. Von Schrenk remarked that the Danish railways fixed a maximum of naphthaline the English a minimum of 6 to 8 per cent, whereas on the railways of the Paris, Lyons & Mediterranean Company the maximum is 25 per cent. He asked what is the importance of naphthaline and whether or not it is of any importance at all. Mr. Cartault responded that naphthaline is recognized as being beneficial and that the Paris Lyons & Mediterranean Company added some of it to all creosotes which fall below a certain standard. He is of the opinion that it closes the pores of the wood.

Mr. Louth, of the Great Western, is well satisfied with the creosote used by this company, but does not attach any importance to the proportion of naphthaline. He did not state any case of chemical deterioration of the ties, and said that those which have been removed after 15 or 20 years of service were taken out because of the wear by the rails.

Replying to a question of Mr. Faulkner as to the best proportion of naphthaline. Mr. Frosterus, of the Finland Railways, stated that his company entirely excludes napthaline in their specifications, as does also the Northeastern Railway of England, this being especially advisable in cold climates. After considerable discussion it was agreed that from about 10 to 25 per cent of naphthaline in the creosote gave the best results, the last figure being the maximum.

Mr. Von Schrenk stated that frequently American creosote contains from 60 to 70 per cent naphthaline, this being a considerably larger proportion than he considered advisable. He added that he preferred the English specifications to the French.

Mr. Tolstopitoff, representing the Imperial Russian Railway asked for information as to the zinc creosote or emulsion process. Mr. Dufur stated that the Dutch railways have used this process for the last 15 years with good results beechwood ties lasting from 15 to 20 years.

4. The question of Mechanical Wear.

Mr. Cartault said that the steel tieplate with four lag screws, used by the P. L. & M. Company, has given excellent results. Mr. Descubes drew attention to the importance of this point, and thinks that this is the most interesting question in connection with cross ties, stating that the lag screw is preferable to the spike so generally used in the United States.

Mr. Muntz said that the only way to secure a perfect fastening of the rails on to the crossties is to make use of the lag screws. It is necessary to avoid the hammering upon the crossties produced by the passing of heavy loads over the track. When the surface of contact begins to wear a piece of felt or soft wood would be put between the base of the rail and the tie. When the holes made by lag screws become too large the Railway Company of the East (France) has a method of putting wooden plugs in the place where the screw is removed, and in which new holes are bored. This has given entire satisfaction.

Mr. Dawson (of the London & Northwestern Railway) expressed his opinion, in stating that the bullhead rail fixed onto the ties with chairs is preferable because of the greater surface which comes into contact with the ties relieving the pressure upon the wood. Mr. Louth (of the Great Western Railway) confirmed Mr. Dawson's remarks, and said that the chairs are placed by that company in a slight depression of the tie. The fastening of these chairs to the ties is all done in the shops or yards before delivery to the tracklayer. He asked the French delegates to inform him as to the cause of the lateral movement of the T-rail, especially at curves.

Mr. Jegou d'Herbeline (of the Orleans Railway) stated that his company also uses chairs, but thought it is not the time now to discuss whether the bullhead rail or the T-rail is preferable. The question is: Is it not better to use lag screws instead of spikes? Mr. Jegou d'Herbeline is of opinion that the wearing out of the crossties which he had been able to see during his short stay in the United States could be eliminated by the use of lag screws instead of spikes.

Mr. Kendrick proceeded with a synopsis of his reports, which was printed in the Bulletin of the International Rail way Congress for 1905, Vol XIX, p. 31, showing the necessity for the railroads of the United States to establish forest preserves because at the present rate of consumption the timber supply in the United States will perhaps be totally exhausted in fifty years. For diminishing the mechanical wear of the cross ties, Mr. Kendrick's railroad is employing wooden shims

as a substitute for tie plates, which are placed between the rail and the tie. After some months of service, favorable results are indicated.

1. Answering a question of the president, Mr. Tolstopiatoff, delegate of the Imperial Russian Railways, said that no exact figures are obtainable as to the available quantity of timber for suitable cross ties, but that in the center of Siberia extensive forests exist. In Russia sand ballast only is used, and for this reaon the ties quickly deteriorate; they are treated with chloride of zinc.

Mr. Gifford Pinchot of the Department of Forestry of the United States called the attention to the rapid disappearance of the forests; pickling to lengthen the life of the tie, would help but not remedy the condition; therefore it is necessary to establish forest preserves. The annual consumption in the United States is 110,000,000 of cross ties for steam railroads only—that is, one-fifth of the total consumption of all kinds of wood in the United States.

Answering Mr. Faulkner's question, Mr. Pinchot stated that it is impossible to give exact figures of the production of timber per acre.

Answering a question by the president, Mr. Cushing stated that the time required for a tree to reach a size sufficiently large for cross-tie purposes is between 22 and 25 years.

Mr. Pinchot stated that forestry culture depends upon local conditions, and that each case must be considered separately, as to whether or not it would pay to hold this land idle for a number of years, paying taxes and fire protection, etc.

Tie Preservation.

The subject of "Wooden Cross Ties," dealing principally with methods of processes of the preservation, was taken up by Section 1. Mr. Muntz of the Eastern Railroad of France stated that it is the custom of his road to drive a dated nail into each tie, and Mr. Tolspotiatoff stated the same method is employed on the railways of the Russian empire. Galvanized iron nails should be used.

The paper of Mr. Spring on wooden cross ties was then considered, "A Study of the Causes of Deterioration in Wooden Cross Ties in Tropical Countries and the Proper Methods of Prevention." In the absence of Mr. Spring the conclusions of his paper were read by Mr. Elsker.

Mr. Louth of the Great Western of England stated that his road had used ties of karri and jarrah wood, and especially ties of karri; his results in all cases were excellent. Mr. Frazer of New South Wales stated that in Australia jarrah gives better service, and that he considers karri a very poor material and that he does not believe that the vertical position of the rail is an objection. In New South Wales it is the custom to incline the rails, with the result that the rails incline still more and tend to bind the wheels; he is now in favor of adopting the vertical position.

Mr. Louth stated that his road adopted the use of Australian woods only after careful investigation and that he believed the Karri superior because the fibers were close and interwoven and held the spikes very tightly. Mr. Armstrong of the Central Railroad of South Africa stated that his road, as well as other roads of his locality, employed jarrah in preference of other Australian woods.

Mr. Braing of the Argentine Republic stated that his road uses quesbracho colorado wood and that experiments for the past thirty or thirty-five years has demonstrated its superiority. Where karri and quebracho colorado were put in service at the same time, the latter wood has given better results; the spikes hold perfectly in the last named wood.

At the request of Mr. Cartault Mr. Brian gaves some information upon the handling of quebracho colorado in the province of Santiago, following from their first handling in the forest until their final delivery in the yards. There are other species of quebracho, notably the white quebracho, and another variety which is somewhat similar to quebracho colorado, but both are of inferior quality to the latter. The cost per tie is from $1.75 to $2 for a tie 2.70 m. in length.

The president declared the discussion closed and the conclusions were reported as follows:

1. The pickling of sleepers in order to lengthen their lives is to be generally recommended; the selection of the antiseptic and the method of performing the pickling operations depend on individual conditions.

2. Creosote seems to be the best preservative of sleepers; it has been successfully tried for a longer time than any other antiseptic and the results have proved that a creosoted cross tie will last in main line service many times as long as an untreated cross tie.

3. Either hard or soft woods may be used, the selection depending on local conditions.

4. Specifications must be exact and great care should be exercised by the inspector before accepting cross ties for treatment. When accepted the sleepers should be piled at least six inches above the ground in open stacks in such a manner as to allow free access of air and light. The grounds surrounding the piles of sleepers should be kept clean and free from decaying matter.

5. The uncovering of the ties by removing the ballast from the top surface does not appear to diminish the life of the wood, even for untreated timber, and it has the advantage of enabling the track inspector to discover at once any defects in the track fastenings, etc., and to apply a remedy. To some special cases, and especially in warmer countries, it may be useful to cover the timber with ballast.

6. It is of importance to combine rigid inspection in accepting sleepers with great care in the selection of ballast; the latter must be permeable, must be capable of being well packed and the packing well maintained, and give good adhesion between the sleeper and its seat. As far as this is concerned the measures which are best for the preservation of the wood are also best for the stiffness of the track.

7. In order to prevent deterioration of the ballast and at the same time help to preserve the sleepers, the careful drainage of the roadbed cannot be too carefully insisted upon in order to insure that water may run off properly.

8. To prevent mechanical wear of the rails upon the sleepers, it is of the greatest importance to fasten the rail to the cross tie in such a manner as to prevent as much as possible all vertical lateral and horizontal movement between the two. The American method of using only spikes will not accomplish this. Lag screws seem to be necessary to obtain satisfactory results.

It is only by keeping careful and accurate records of the number of ties treated, the manner in which they were treated, and where and when they were placed in the track, together with a record of when they were taken out of the track, that it is possible to determine whether any one particular treatment is giving satisfaction and is a good investment. Every railroad management using treated ties is urged to have them all marked, preferably with dating nails, and that a careful system of records should be instituted at the earliest possible time.

Rails.

In accordance with a resolution adopted at a previous meeting, Messrs. Dudley, Dufour and Van Bogaert, who constituted a special committee, presented 14 conclusions.

First conclusion: "The subgrade in the foundation which must sustain the effects of the moving loads, as distributed through the wheel contacts to the rail section, cross tie and ballast, is loaded and unloaded for the passage of each train, and partially for each wheel. An improvement in loading the foundation increases its stability, and is followed by an increase in capacity."

Mr. Dudley explained that the adoption of pony trucks for locomotives has had the effect of relieving the track by preparing it, as it were, by these lighter loads for the more heavily loaded drivers, and of keeping it in place when the great undulations of the track, which take place on the passage of the heavy wheels, are transmitted snake-like to the front of the locomotive. With this in view, Mr. Dudley proposed the conclusion, which was adopted.

Mr. Dudley, having shown by a diagram the character of the wave-like transformation which takes place in the track on the passage of the locomotive and is transmitted ahead of the latter, Mr. Johnson, while of the same opinion as Mr. Dudley, stated that the text of the conclusions was not exact, in as far as it says that by the proposed methods the profile of the rail is strengthened and made more rigid, but it works under better conditions. He, therefore, proposed a modification of the text of this conclusion.

Mr. Descubes, referring to the proposed conclusion attributing important advantages to the bogie truck as regards maintenance of way, remarked that this question seemed to him to come also under the jurisdiction of the second section, and it should be debated conjointly with the latter. The president called attention to the fact that the revised version proposed by Mr. Johnson made no allusion to the advantages afforded by the truck, and merely stated that a well finished track, well laid on its foundation, behaves better under the passing of engines of any kind. Consequently the section adopted the form of wording proposed by Mr. Johnson, which read as follows:

"A well fished rail section and the foundation under it have lower strains, because the rail thus forms, to some extent, a continuous beam with several supports."

After discussion, the third proposition of the conclusions of the special commission was rejected. Mr. Van Bogaert continued the reading of the proposed conclusions framed by the special committee:

"The weight of rails tends to increase with the speed. Track with heavy rails requires less maintenance and renewal. The rail is less subject to wear and breakage. With carefully maintained tracks, good rolling stock and well balanced locomotives the necessity for employing heavy rails is less urgent." This conclusion was adopted.

Mr. Van Bogaert passed to the fifth proposed conclusion, which read as follows: "It would be desirable to widen the head of the rail and give it quite a large radius (30 to 35 centimeters). The minimum height of the head may be reduced between 3 and 4 centimeters. By widening the head the bearing surface of fish plates would be increased and premature wear of the surfaces of contact between the fish plate and the rail, and the consequent deformation of joints would be avoided. For this same reason the steel selected for splice bars should be as hard as that of rails. A well designed splice bar, by its grip at the rail ends, aids in continuing the bending movements under the passing locomotives and cars from one rail to the next."

Mr. Cartault thought it unadvisable to widen the head of the rail and increase the radius of curvature to the extent proposed. The advantage aimed at is realized only from contact of new rails with equally new tires. This condition is quite exceptional, and under these circumstances the gain is imaginary. Mr. Cartault therefore proposed striking out the paragraph relating to widening the rail-head and metal used in fish plates.

Mr. Johnson considered the question of metal in fish plates a delicate one, because the adoption of a hard metal renders it difficult to make non-circular bolt holes, which cannot be drilled by machine. Mr. Descubes shared this opinion. He added that a fish plate of comparatively soft metal, when worn at certain points of contact with the bearing surfaces at joints, may be easily replaced, but if the fish plate is made of as hard metal as the rail, the latter wears to the same extent. In that case the track cannot be put in good order except by cutting off the ends of the worn rails. This observation only applies to ordinary flat or angle splice bars. Of course, in the case of special splice bars, which at the same time form a rolling surface for the tires or fish plates supporting the rail from beneath, the steel in the plates may be as hard as is the rails.

Mr. Dudley, in this connection, stated that his company has adopted a 50-kilo rail with hard steel fish plates, but the web is no difficulty in punching. The rail is used particularly in the Grand Central station in New York. These fish plates, which have been in use over twelve years, are of hard steel, with a tensile strength of 77 kilos per square millmeter.

On the other hand, Mr. Louth stated that the Great Western has tried hard metal for its fish plates, and has had many cases of broken plates.

Mr. Cushing of the Pennsylvania Lines West expressed entire agreement with the European delegates as to the proper width for the head. He thought too wide a head, aside from certain advantages, offered objections which more than counterbalanced the advantages gained.

Improved Rail Crossing (Frogs).

Improvements in rail crossings; spring frogs movable point frogs and crossings and continuous rail crossings in which the gap at the throat of the frog is done away with, which shall satisfy all the requirements of modern traffic and stand heavy locomotives being run over it at high speed without any shock.

Reporter for all countries, Mr. C. W. Buchholz, consulting engineer Erie Railroad, 21 Cortlandt street, New York city.

Mr. Buchholtz presented a short analysis of his report, indicating some special points which, in his opinion, invite discussion. He stated that movable rail crossings (frogs) are in use on many American railroads. Mr. Buchholz then read his conclusions.

Mr. Fraser stated that movable frogs have also been tried to a large extent by the Australian railways. They have been placed more especially at points where the speed of trains does not exceed 50 kilometers per hour. The result of the trials was satisfactory and the wear of the frogs light.

Mr. Ramsay has also adopted on his road (Chicago, Peoria & St. Louis), movable frogs, without any limits as to speed, at their points of location. Trains run over these frogs in a satisfactory manner. He, therefore, supported the proposed conclusions.

Mr. Ashby (Lehigh Valley Railroad) uses the same style of frogs, especially at switches at the entrance to depots, where the speed of the train is limited. At stations where all trains stop ordinary frogs, with manganese steel points, are preferably used.

Mr. Ramsay added to his first statement that his road uses movable frogs only at points where trains pass at high speed; where the speed is reduced ordinary frogs are used. The conclusions of Mr. Buchholz are adopted in the following terms:

"That on all main lines carrying heavy traffic with axle loadings on the locomotive of over 50,000 lbs., and with loads on the rolling stock reaching as high as 40,080 lbs. per axle, the 'spring rail frog' or the 'hinged spring frog' may be used with perfect safety, where the traffic on the side tracks connecting with the main track is very slight compared with the main traffic.

"That the 'movable point frogs' may be used at all termini where the space for crossing from one track to another is limited, but that where space permits, and where high speed is necessary, a series of switches, with the best designed switches and fixed frogs are preferable."

Automatic Block Signals.

What are the recent improvements in automatic block signaling apparatus, and what progress has been made in their introduction?

Reporters for America, Mr. C. H. Platt, ex-general superintendent Western district New York, New Haven & Hartford Railroad, New Haven, Conn. Other Countries, Mr. Margot, engineer assistant to the management of the Paris Lyons & Mediterranean Railway Company, 88 Rue Saint Lazare, Paris.

Mr. Platt, having been invited to sum up his report, which was printed in full in the Bulletin of the International Railway Congress for 1904, Vol. XVIII, p 1008, explained that it was not intended to institute a comparison between the different types of signals, the questions submitted to the congress being the following:

First—What are the latest improvements in automatic signals?

Second—What progress has been made in their introduction?

The facts stated in the first part of the report are based on the information given by the different companies manufacturing automatic apparatus. The second part contains the statistics furnished by the railroad companies using the apparatus, and shows the progressive development of their use and the results obtained. The last part of the report contains the conclusions submitted to the congress for approval.

Mr. Platt thought that these conclusions should be adopted because the reports hitherto made on the question of the automatic block system have been either unfavorable or noncommittal.

The automatic system has now come into sufficiently general use as to leave no doubt of its efficiency. The question whether an automatic or a manually controlled system should be adopted on a given line or under given circumstances is not subject to examination. The decision to adopt one or the other of these systems in special cases should be left to the judgment of the companies interested. But the automatic system has reached such a high degree of perfection that it may be considered as a safe and economic method of protecting trains on railways, and, with this in view, it should receive the approval of the congress, which is the highest authority in railway matters.

During the year 1904 notable progress has been made. While the number of movements made on the total of the lines furnished with the automatic system increased 144 per cent, the number of failures, consisting of indicating "danger" when the line was "clear" increased 32 per cent only. On the other hand the number of more serious failures, indicating "track clear" when the track was really occupied decreased by 30 per cent. These results were observed in the working of all signals, on those in service for 30 years, as well as on those more recently installed.

Mr. Margot explained that in Europe the automatic block system has remained practically without progress, because it had been in operation upon only five sections of lines, representing a total of 119 kilometers, or about 3-1,000 of the total lines operated by the block system. During this time the American railroads had proceeded on a large scale to make their track automatic. He had been interested to look for the cause of this state of affairs, which has led him to take up the whole question of automatic block system and to make a comparative study of the conditions of operation with a block system which has long been in use on the European roads, and he has thus been led to the following conclusions:

The automatic block system appears to be a perfect theoretical solution when a track circuit is used. The track circuit accomplishes in the most complete way the spacing of trains on the same line. It solves in a very simple way special cases of tracks occupied and those arising from breaking of couplings. It allows the signal to exercise a permanent control over the condition of the track. Finally, by its automatic action it avoids errors due to the human element, and the absence of the signalman is without consequence if everything goes in its normal way.

But in practice account should be taken of the possible failures of the apparatus, and in this respect the automatic systems tried in France have not yet attained that degree of perfection which should be required even more from the automatic system than from those which are not automatic. It should also be remembered that accidents are unavoidable in the running of trains, and that the presence of men stationed on a line enhanced the degree of safety, especially on a very busy line. The automatic block system does not furnish the same guarantee, except at stations where there is an agent engaged in watching the movement of trains and intervening in the case of accidents, so that the automatic block system does not always result in those economies in the signal staff which is really its object. This is a question of local conditions.

With this in view the reporter referred to the answer obtained by him from the Belgium State Railroads, on which 1633 kilometers of the Siemens block system are installed. The state of Belgium has experimented with the Hall system and has given it up for the following reasons:

First—No economy to employees is possible when the line has many stations or many grade crossings.

Second—Unavoidable failures in the apparatus should be taken into account, as in these cases the intervention of the employees is most useful.

In short, there is no special advantage in introducing the automatic system on lines which are already provided with a good working system, but on new lines it may be advantageous.

The reporter, therefore, proposed the following conclusions:

First—On lines already equipped with non-automatic systems working well and giving full satisfaction it is frequently of no advantage to substitute the automatic block system in their place at a great expense, or at any rate under those conditions which apply to the working of lines outside the United States of America.

Second—On lines not yet equipped with the block system it may be found that the automatic block can be adopted with advantage, according to the particular conditions, the service to be organized and the economy of staff to be effected.

M. Pieron thought that the interlocking block system in use on the North French Railways gives as great safety as possible, in that it avoids, to a large extent, the possibility of human error. The substiution for the present system of the automatic block system will involve considerable expense in installation which would in no way be justified by the object to be obtained, in view of the fact that the results already attained are very satisfactory.

To the remarks of M. Pieron, Mr. Riche added, in the name of the Eastern Railroad of France, the following remarks: The question treated can be summed up thus: What is the ratio between human error and the failure of apparatus? It seems certain that when the traffic of a line increases in large proportions one cannot count indefinitely on infallibility, and that the guarantee of safety thus decreases. It would seem that this reduction in the element of safety would be less with automatic apparatus. In other words, it appeared to him that the running of trains on a line can be more readily increased without reducing the safety, with automatic apparatus than with apparatus controlled by men.

Mr. Riche held the opinion that under such conditions it is proper to take the future into account, and he concurred with the very broad conclusions of Mr. Margot, who leaves to each company full liberty of action. He concluded by asking the representatives of American railroads whether they still have

lines not equipped with automatic apparatus, and, if so, whether they intend to so equip them.

Mr. Theodore Vorhees (Philadelphia & Reading Ry.) reported to the section that he had installed the block system on the New York Central & Hudson River lines some fifteen years ago; 102 cabins have been constructed on 142 miles. The system installed having been copied from the English system (Saxby & Farmer); soon, however, the traffic became too dense and it became necessary to use the system permissively instead of absolutely.

About ten years ago the Hall system was introduced on the Philadelphia & Reading lines; a few cases of false indications occurred, the majority of which were due to lightning, fusing the points of the relay. These defects were soon eliminated. The number of false indications, even during the months when storms were most frequent, was soon reduced to a maximum of three or four. On all parts of his system where the traffic is dense, that is, on about 400 miles of the 1,400 in operation, this system is in use, and the complete replacing of hand signals is only a matter of time. By the installation of distant signals placed at a distance sufficiently ahead of the ordinary signals, the Philadelphia & Reading road has avoided the difficulties resulting from an engineer passing a signal erroneously and entering on the following block.

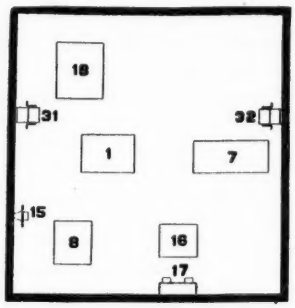
Sir Charles Owen (London & Southwestern Railroad) stated that at a point which has not yet been mentioned, and which is of great importance, consists in the installation of a mechanical means to operate even non-automatic signals. By such an installation his company has succeeded in reducing to a large extent, the number of men necessary at its stations. When the installation of the necessary operating power has once been made the introduction of the automatic system within the distance controlled by it is easily made. On the London & Southwestern road the mechanical system generally controls six miles each side of the power station. The absolute block system is in force on all the lines of the company, and it suits the requirements of a light traffic perfectly, but when the traffic gets heavy an automatic system is much more advantageous. No false indications, with the exception of those indicating "danger" when the road is clear, have occurred on the lines of his company.

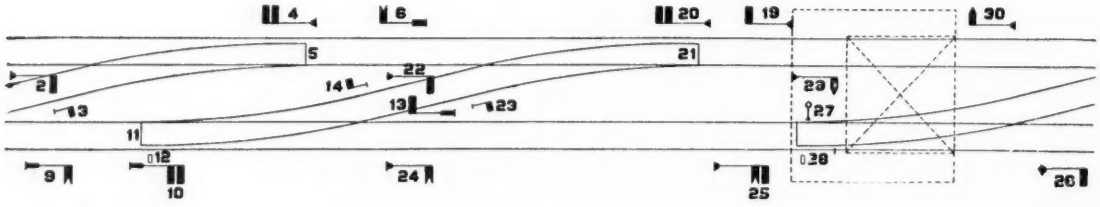
Since the introduction of corridor cars it is no longer necessary to have employees along the line to watch the trains, for the train hands can see all that is going on. An innovation introduced on the London & South Western road consists of every semaphore signal, which permits the train conductor as soon as the train stops to ascertain the cause of the detention.

Mr. Theo. Voorhees (Philadelphia & Reading) informed the Section that the terminal station of the Philadelphia & Reading at Philadelphia, where the daily movement of trains is about 250 inbound, and about an equal number outbound, is protected by the Westinghouse interlocking system. The signals are installed for distances of one and one-half miles from the station. On the Philadelphia & Atlantic City division, where the traffic is very heavy, and the length is 55½ miles, there are only three interlocking cabins; the rest of the line is protected by the automatic system.

Mr. Gustave Bleynie (French Southern Railways) said that the Hall system has been put in operation on some parts of the lines of his company, but it has shown quite a number of failures, especially by signaling "danger" when the track is really clear. The proportion of failures has been about 2 per 10,000 movements, which is a much higher figure than that given by Mr. Platt for American practice. Many of these failures have been caused by the crossing of the overhead wires necessary for forming the circuits.

The speaker asked the American engineers if they can furnish data as to the number of failures on lines where overhead transmissions have been either entirely abandoned or largely reduced in number. Does this reduction or abandonment give good results and does it produce saving in the electric current necessary to operate the apparatus? Mr. Platt replied that he could not furnish any figures, as lines using overhead wires have been practically abandoned. The system most in favor in America at present is track circuit by which the energizing current is transmitted through the rail. This system perhaps causes more failures—i. e., signals of "track occupied" when the track is clear—but it has the great advantage of signaling not only the presence of a train in a certain block, but also a number of other accidents which may occur, such as the presence of a truck, a broken rail, open switch, etc.





Col. Yorks (government delegate, England) was of the opinion that the report presented by Mr. Platt adhered more closely than that of Mr. Margot to the question which the Congress has to consider—viz., that the recent improvements are in automatic block signaling apparatus. According to him any comparison between a hand signaling system and the different automatic systems should be excluded as irrelevant. He thought that the Congress should accept the conclusions presented by Mr. Platt. He noted, however, not only that different companies do not agree as to the superiority of any one automatic system over other systems recommended, but they have never expressed themselves positively upon the general principles which should govern automatic signaling. He has always been a strong advocate of track circuits, but he has observed, at least in English practice, that some cars with two axles do not invariably complete the circuit and consequently do not operate the signals. This has greatly shaken his faith in the efficiency of automatic systems depending on a track circuit.

Mr. Theo. Vorhees (Philadelphia & Reading) replied that to operate the signals it is necessary to complete the circuit, and therefore if the construction of the wheels or axles does not admit of this, the signals cannot give the indications which they are intended to transmit.

Mr. Platt desired to call the attention of the assembly to the statistics contained in this report, which were compiled to meet the question framed by the Congress of 1900 and to show the progress made with automatic signals since their adoption on a large scale. The results obtained in practice are shown by the great number of signals now in use, there being now over 20,000 in the United States, protecting 10,000 miles of track. These have made more than 405,000,000 movements in the past year. He urged that the Congress should adopt the conclusions in his report.

The president presented the conclusions and after a long discussion in which many of the members of the Section took part, they were approved in the following terms:

"The Section approves the following provisional conclusions proposed by Mr. Platt in his paper:

"That automatic signaling, properly designed and installed, be recognized as a suitable means of protecting train and switching movements.

"And notes that there has been much improvement and extension of the automatic signaling since the last Congress, and that those who have used it have found it effective for their purpose.

"The Section is not prepared to recommend automatic block signaling for general adoption to supersede existing systems, but they consider there are many cases of heavy and increasing traffic where it has special advantages."

RAILS.

There was an interchange of opinion on the subject of the qualities of steel required for fish plates. The various members brought out the considerations which led them to require certain characteristics in the metal which will insure its punching qualities, as well as prolong the life of the angle bars and rails by reducing wear. After this interchange of opinions, M. Van Bogaert proposed a condensed reading of the various propositions formulated. It appeared to him useless to state that the metal should not be so hard that it cannot be punctured, this condition being obvious. He, therefore, proposed the following text:

"Enlarging the head of the rail permits an increase in the bearing of the fish plate. The wear on the surfaces of contact is, consequently, reduced, and with it also the deformation of the joint. For this purpose the steel of the fish plates should be almost as hard as that of the rails, with the limiting condition of avoiding brittleness. Well designed fish plates help by their grip at the ends to transmit from one rail to the other the bending movements, which are caused by the motion of the locomotives and cars."

The chairman stated that the general harmony of the opinions of the American and foreign delegates as to the proposal to increase the hardness of the metal used for fish plates. The only point on which they do not perfectly agree is the maximum limit of the hardness.

The text proposed by M. Van Bogaert was approved by the Section.

The Section then began to examine conclusion No. 6, and Mr. Cartault proposed that for the word "insufficient" the word "sufficient" be substituted, which appeared to him more in accord with the actual case. The Congress should not declare that all methods at present in use fail to secure a metal completely safe in operation. If, notwithstanding his opinion to the contrary, it is true, as has been stated, that present methods are insufficient, the Congress could not accept that condition without indicating what specifications should be substituted.

Mr. Dudley explained that it was not the intention of the reporters to condemn and abolish the present methods, but to develop them and to make them more precise. He showed by photographs the existence, in the metal of the rail, and sometimes extending for its whole length, of flaws of a nature dangerous to strength. He also called the attention of the Section to various photographs of rail metal of different grain, and concluded from the examination of these photographs that a microscopic test of the metal is of the highest importance. He then discussed the cold rolling of the metal, but expressed the opinion that this question has not been made sufficiently clear up to the present time, and that further experiments are still required to determine the precise conditions under which the rolling should be done.

M. Dufour held the same view as M. Cartault, and stated that the present methods of testing should not be pronounced insufficient, but he thought that the Congress may state that these methods are not wholly satisfactory, because the Section recognized the advantage which would result from the improvement of these methods through new tests.

M. Cartault dwelt on the distinction which, in his opinion, should be made. The present methods are sufficient to insure a good quality of steel, but he admitted that they are not sufficient to detect flaws in a mass of metal. These flaws, or cracks, have different characters and forms; they cannot be discovered until after manufacture, but they can be discovered when the rail is put into service, either by its deformation or by an abnormal wear, or also by the sound of the hammer, as is the practice of different railroad companies. It is, therefore, of importance, he thought, that the conclusions should recognize this distinction.

Mr. Job thought that the majority of breaks in rails are caused by flaws; he showed a photograph of a characteristic result of these flaws. He proposed to insert into the specifications for furnishing rails a clause compelling the rail manufacturer to pay the cost of the renewal of all broken rails, due to the existence of cracks during the first five days of their life.

M. Cartault remarked that this clause exists on the Paris, Lyon & Mediterranean, where the broken or defective rails are replaced at the cost of the contractor, during the first six years following their being laid in the track. A portion of the rails supplied under each contract is laid in sections, which are kept under observation, upon which the company alone decides, taking into consideration whatever the conditions of the traffic, the curvature and the grade of that portion of the track may be, and without consulting the contractor as to the selection of the points of observation. Disputes are finally settled by the engineer of the permanent way. At the expiration of the time of the guarantee and after having stated to the contractor the number of broken and imperfect rails, the company deducts from the sum retained as a guarantee the amount due from the contractor.

Mr. Buchholz added that if the contractor should be required to guarantee the life of the rails during the specified time, he should also be left free to choose the process of manufacture and the composition of the metal. The Erie Railroad desired some time ago to specify a given composition of the steel for its rail contracts. The contractors then declined all responsibility for the material furnished, and the company was obliged to return to its previous specifications.

Mr. Wilgus reported to the Section that the New York Central & Hudson River Railroad recently drew specifications for a supply of rails which gave satisfactory results, but that the steel works, having formed a trust, have forced the company to adopt the specifications of the trust, but it stipulates a guarantee of five years. Notwithstanding this guarantee, the company was very badly served and obliged to return to its own specification and give up the guarantee feature.

The president in summing up the discussion stated that

while the foreign engineers cannot admit that the Congress express itself that the steel of the rails cannot be sufficiently guaranteed for service, the American engineers, on the contrary, declare that the metal furnished to them is poor and request that their foreign colleagues co-operate with them in determining specifications which will afford protection against metal of inferior quality.

On these lines M. Von Bogaert proposed a new test which takes account of the distinction to be made between the two continents:

"The usual tests of quality (by tension, bending or impact), and the ordinary methods of acceptance enable us to obtain a steel substitute for lines with fast trains, but they are insufficient for American railways, where the load on the wheels is greater. It is, however, desirable to seek for methods of investigation to detect flaws.

"There is a tendency to watch more carefully the physical treatment of rails, by controlling the temperature during rolling, in order to obtain a fine grained metal. Some improvements in the method of manufacture tend to reduce the flaws in the ingots, and lead us to the hope that the number and length of these flaws will be reduced in the finished rails also."

This reading was adopted.

The seventh conclusion is as follows:

"To obtain a good quality of steel it is desirable to roll T-rails with flanges at least 13 mm. thick at the edges."

It was adopted.

As to the proposed eighth conclusion, Mr. Dudley reported that he had visited a great number of foreign rolling mills and all those of North America. He has become convinced as the result of these visits that it is impossible to impose the same requirements for composition of metal on all steel works, and that specified strength should be the only requirement. M. Cartault supported this view, as the most varied compositions may furnish similar steels, as far as strength and wear are concerned.

Mr. Louth (Great Western) reported that his company requires from its contractors a given composition of steel, together with a maximum strength and a minimum elongation. The Great Western Company is well satisfied with the results of these specifications which almost entirely avoid flaws in the metal.

After an extended discussion, in which several members of the meeting took part, Messrs. Dudley and Van Bogaert both proposed the text of the following conclusions:

"The metal of the rail should be sound, of fine grain, and should have an elastic limit of 40 to 42 kilos per square mm., with an elongation of 10 to 15 per cent, measured on a length of 50 mm. The test piece should be taken from the head of the rail."

This conclusion was adopted.

Conclusion 9 was adopted and followed:

"Nickel steel is not used for rails, and it is useless to try it for European traffic. In America, where the wheel loads are greater, nickel steel is being tried on specially busy tracks."

The section then passed to the discussion of the tenth conclusion, concerning the location of the joints.

Several American members furnished detailed information to the section on the various systems used or being tried in America, as to object desired and the result obtained from each of them.

Mr. Louth stated that the information furnished by the colleagues as to the American system have shown that the results obtained from supported or from the suspended joints are different on the roads equipped with T-rails from those on the roads equipped with bull-headed rails. The Great Western Company recently used some joints supported on chairs; it had to abandon these joints because they increased the hard riding of the cars and caused a hammering of the metal. This hammering was very noticeable to the passengers. He thought that a suspended joint is incomparably the better for bull-headed rails. All of his English colleagues agree with him on this point, and he thought that those of his French colleagues who have bull-headed rails will share his opinion.

Terminating the discussion, Mr. Van Bogaert proposed a conclusion, taking into account the information supplied, and reading as follows:

"Several arrangements of the joints for T-rails with angle bars, either suspended or supported, are in use; both give good results. In America a successful attempt has been made to reduce the length of expansion joints on heavy rails of great length."

Visit of Engineer Delegates to the Schenectady Works

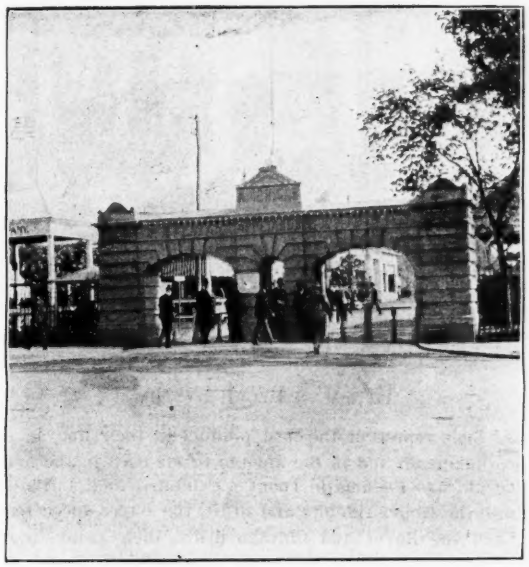
A TRAIN of six Pullman cars, carrying over one hundred of the engineering delegates to International Railway Congress, arrived in Schenectady, N. Y., on the morning of May 26, on their long tour, which will be finished in New York on the 27th of May. The party was accompanied in their trip from Montreal by A. J. Pitkin, president of the American Locomotive Co., and were met on arrival at Schenectady by J. E. Sague, vice-president; R. J. Gross, second vice-president; Leigh Best, third vice-president; C. B. Denny, treasurer; H. C. Hequembourg, purchasing agent; J. McNaughton, general superintendent, and a party of guests brought from New York by Vice-President Best (there is no better host imaginable). An inspection of the immense locomotive plant by the visitors, among whom was the very flower of foreign railway talent, was followed by a sumptuous banquet in the assembly hall of the works.

President Pitkin presided, and after the good things were absorbed, gave a hearty welcome that left no doubt in the minds of our foreign brothers that while a long way from their hearthstones, were among good friends. Mr. Pitkin called upon W. J. Clark, manager of the foreign department of the General Electric Co., who in well rounded periods got "hands across the sea" in a most pleasing welcome, referring to the fact that the visitors were working with us for the same results—common progress in the arts making for advanced railroad practice.

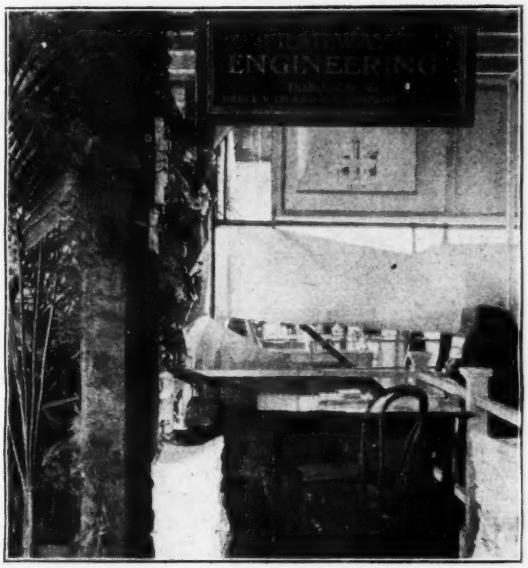
For the visitors, Mr. Rudolph F. de Salis, director of the North Staffordshire Railroad of England, replied to the greetings and expressed the hope that his people might have the opportunity to welcome American railway men to England. The cordial treatment accorded the visitors while here only served to make stronger ties. Mr. C. Tenni, chief engineer of the Southern Railway of Austria, Mr. E. H. Stieltzies of Holland, and M. Edouard Sauvage, chief engineer of mines and of the company of the west, also made responses, all of which were expressive of the deepest appreciation of American hospitality, and meant plainer than spoken words that au revoir would be their parting word—not farewell. After enjoying patriotic airs by the orchestra, the party went by special train of 6 cars, drawn by one of the new electric locomotives, to the trial track of the New York Central, where a speed spurt was given to the passengers. Not more than 70 miles an hour was reached, but that was satisfactory to those on the train, after which the train was taken to the General Electric Works and the party taken through the plant, which covers an area of more than 400 acres, and has 18,000 employers. It is seldom that such unstinted and open-handed hospitality is extended visitors anywhere as was given our friends from over the ocean, and from expressions heard in several languages it is certain that they were never treated handsomer than by the American Locomotive Co.

Railway Appliances at Washington

IN the exhibit of Railway Appliances, the general arrangement and character of the display was very similar to that at St. Louis, though on a lesser scale, but what was lost in magnificent distances was more than compensated for in the selection of specialties exhibited. The same care to make the most of the space allotted, was to be seen in the smaller pavilions on the ground, as was shown in the main building. The lighting facilities were on a most extensive plan, making the evening show fully as effective as that of the day, for the outside exhibits as well as those in the pavilions, large and small. A brief resumé of some of the exhibits will convey the impression that the show was an extensive one.



GENERAL ENTRANCE.



RAILWAY ENGINEERING.

Armstrong Brothers Tool Co., Chicago, had a comprehensive exhibit of their tool holders and holders for grinding tools and inserted cutters. Among their exhibits was a claw bar having two inserted teeth side by side let into the head of the bar. This device had the strong point that it need never be out of commission when two inserted teeth are available, as the bar itself is made on a design that defies the roughest usage. The tool holders for turning and boring were complete and ready to go from the exhibit to the shop. They also showed the only machine made expressly for grinding inserted tool cutters.

In jack construction the Duff Mfg. Co., Pittsburg, had on exhibition some samples of roller bearing ratchet screw jacks that represented advanced ideas in devices for lifting loads. These jacks are made of malleable iron and steel, with a ratchet of special construction, the direction of motion being instantly changed. The bevel gears and screw are of steel.

GENERAL RAILWAY SIGNAL CO.

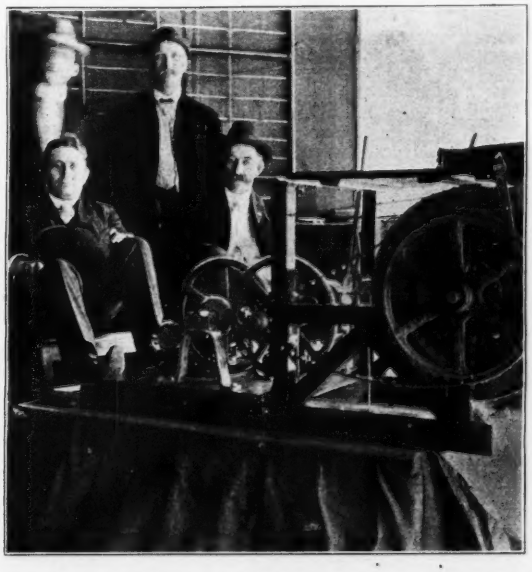
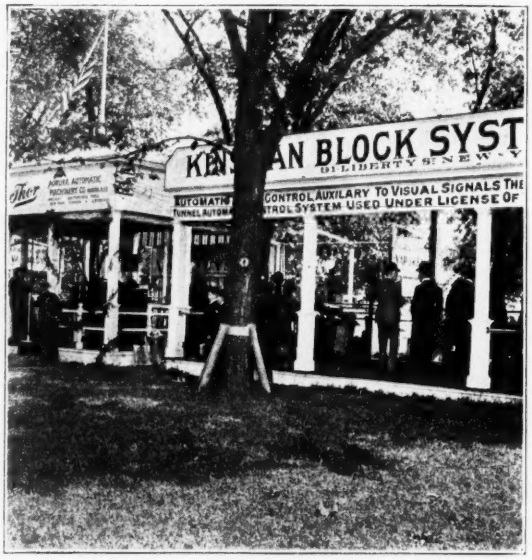


EXHIBIT OF CONCRETE MIXER OF THE INTERNATIONAL FENCE AND FIREPROOFING CO.

General View Showing Wells Light, Elliott Frog & Switch and William Wharton, Jr., & Co.



Kinsman Block System.

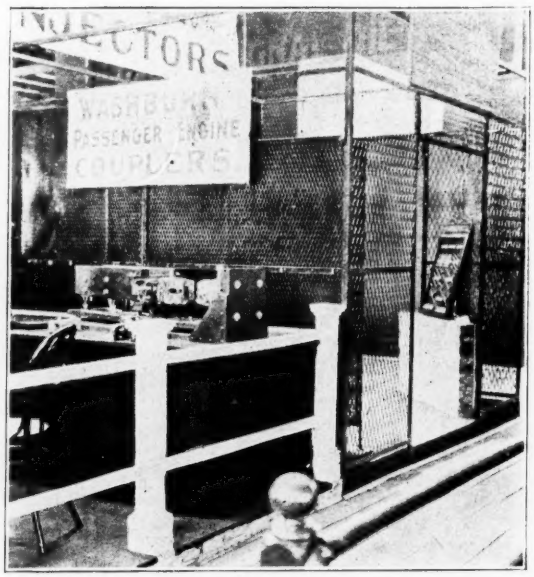
The exhibit of the Acme White Lead and Color Works, of Detroit, Mich., was an attractive one, made so by the artistic arrangement of paneling around the exhibit space. These panels were of many woods, and finished as for passenger train cars inside and outside. Their "Pandect," which is a rust preventive for metal structures and cars, is a specific for the ravages of alkali, acid or gas, preventing their attack of metal most effectually, was well exploited.

The Aurora Automatic Machinery Co. had an exhibit in their pavilion of their "Thor" pneumatic tools. These embraced drills, reversible and non-reversible, of capacities ranging from a 2½-inch drill down to watchmaker's sizes. Air machines for reaming and tapping and wood boring were seen in a large number of sizes, also a full line of hammer for riveting, caulking and chipping, all of which were in operation. One of the novelties of the "Thor" tools was an air turbine driving a portable cut-off saw, the uses of which in car work were obvious, as the little tool could be carried and operated anywhere. For dressing the edges of car flooring and roofing, this machine will fill a place now ready for it. These tools represent the best product in their line, in point of workmanship and in the amount of air used in the motors.

The Chicago Pneumatic Tool Co. exhibited their Little Giant motors, the Keller riveters and drills, the Bayer speed recorders, and the Bayer and Chicago drills, their paint spraying machines, besides their pneumatic geared hoists and trolleys. In connection with the latter is an automatic brake worked by air, which is used to hold the load in a given position and for any length of time desired.

The Railway Appliance Co., Chicago, had in their exhibit in the main building two motor cars operated by gasoline. One of these was for railway inspection service and made to carry four persons. A novelty in this line was the larger of these vehicles which was designed to carry eight passengers. A still larger one is constructed for operation on railway tracks, with a capacity for 30 passengers, but was not shown. They have a radius of action only limited by the means to obtain gasoline and are good for speeds above 40 miles an hour. The Oldsmobile Co. are the builders of these machines.

Paul Dickinson—Geo. P. Nichols & Bro.



Merritt & Co.

S. F. Bowser & Co., and Their Representatives.

Armstrong Bros. Tool Co.

McCord & Co. had their usual fine display in their pavilions. Among their products were their malleable iron journal box, spring dampener, McKim gasket, McCord lubricator and Gibraltar bumping post. The latter was also shown installed in the track exhibits. The McCord draft gear, which was said to have the best points of a friction gear, was one of the new things shown.

Paul Dickinson, Chicago, was on record in his pavilion with his cast iron smoke-jacks and ventilators, and had a round house smoke jack which was adjustable to height and position, in full size, which was operated by a touch of the hand. As an example of a thorough understanding of smoke-jack utensils, this exhibit was in a class by itself. In this pavilion was also the exhibit of George P. Nichols & Bro., with their transparencies showing the installment of their transfer tables and turntables in some of the largest plants of this country.

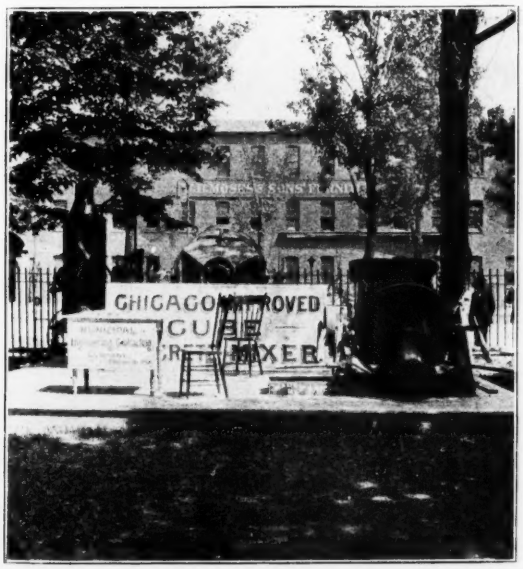
The Sherwin-Williams Co., Cleveland, O., exhibited their railroad paints and had photographs of their numerous paint plants where their colors are produced, making an interesting show to the visitor.

The King-Lawson dump car was on exhibit on the grounds and was the object of constant attention. This car is all steel and is the latest development of the dump principle for cars. It was built by the Middletown Car Works.

A very unique and interesting exhibit was that of the American Valve and Meter Company, of Cincinnati, O. The Poagh Water Column with a Fenner drop spout and the Anderson Economy Switch Stand were shown and hourly stereopticon shows illustrated the complete as shown in their catalogue.

Among the most interesting exhibits was that of S. F. Bowser & Co., Ft. Wayne, Ind. In their large space in the main building were shown their oil house equipments for railroads and factories, shop tanks, cabinets and underground gasoline storage.

In their own building was well displayed by the Otto Gas Engine Works, Chicago, their gas engines, pumping machinery,



Municipal Engineering and Contracting Co.

Buda Foundry & Mfg. Co.

DUFF MFG. CO.

EXHIBIT OF AMERICAN VALVE & METER CO.

dynamos, air compressors, Otto water crane, tank valves, Moore track jack, Winter's automatic signal batteries and track wrenches.

Geo. P. Nichols & Bro., of Chicago, showed illuminated photographs of electric equipment for transfer tables, turntables and draw bridges.

The Wells Light Manufacturing Company in an exhibit in the main building and also in another exhibit on the grounds showed three sizes of the Wells Light apparatus, locomotive tire remover, tripod outfit and the Wells standard oil gas lamp.

The Buda Foundry and Manufacturing Company, of Chicago, made a large and comprehensive exhibit of their track supplies, crossing gates, track drills, railroad velocepedes, switch stands, forks and frogs.

The International Fence & Fireproofing Company, of Columbus, O., exhibited their concrete mixers, wire fences and gates and reinforcing for concrete.

The Edison Manufacturing Company, New York, exhibited an extensive array of batteries for railway work. This included batteries of different sizes for signal, motor and gasoline engine uses.

The Ramapo Iron Works, Hillburn, N. Y., had an exhibit in the main building where full-sized samples of frogs, switches, switch stands, etc., were shown. A working model of McPherson's patented switching frog was exhibited in this space. Switch stands for yard and main line work in a number of different styles, among which was a special design with an adjustable throw, were on exhibition.

Elliott Frog and Switch Company, E. St. Louis, Ill., exhibited several samples of frogs and switches which included two new designs of adjustable split switches and the Eureka spring rail frog. The exhibit also included ladder switch-stands, main line switch-stands and an automatic parallel ground-throw switch.

The Pennsylvania Steel Company and the Maryland Steel Company of Philadelphia had a large pavilion in Plot 13, in which were exhibited various kinds of steel products, including forging, castings and structural shapes. On the track on D street this company had a supplementary exhibit in the

ACME WHITE LEAD & COLOR CO.

AURORA AUTOMATIC MACHINERY CO. EXHIBIT.

DILWORTH PORTER AND CO.

SHERWIN-WILLIAMS CO.

shape of a 59-ft. bottom chord for the Blackwell's Island bridge, which weighed 120 tons and was mounted on two special cars designed for carrying heavy steel work. In their exhibit at the monument grounds were railway frogs, switches, switch stands, locking devices, steel castings of various kinds for locomotives and general work, a center section of a turntable in full size mounted on roller bearings, besides a number of blue prints and photographs illustrating large bridges, both in draw span and roller lift. A model of the U. S. Cavete floating dry dock containing a model of the United States battleship West Virginia, was also shown in this exhibit. This dock is in the process of building by this company.

The Weber Railway Joint Manufacturing Company, New York, had a booth which is illustrated in this issue, in which railway joints for all kinds of service were exhibited. These include compromise joints, joints connecting T and girder rails, insulated joints, etc.

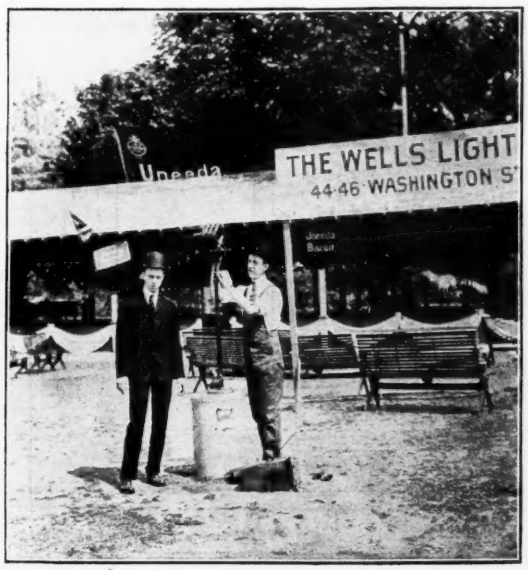
The Cleveland Frog and Crossing Company, Cleveland, O., exhibited in the main building the Lucus hard-service rigid frog.

The Belle City Malleable Iron Company, Racine, Wis., exhibited in Section D of the main building the "L. & S." anti-rail creeper and adjustable rail brace, the Pecktonius tank lug and the Murray straightening jack.

The Norfolk Creosoting Company, Norfolk, Va., exhibited creosoted material of all kinds, including piles, ties and building material for railroad uses.

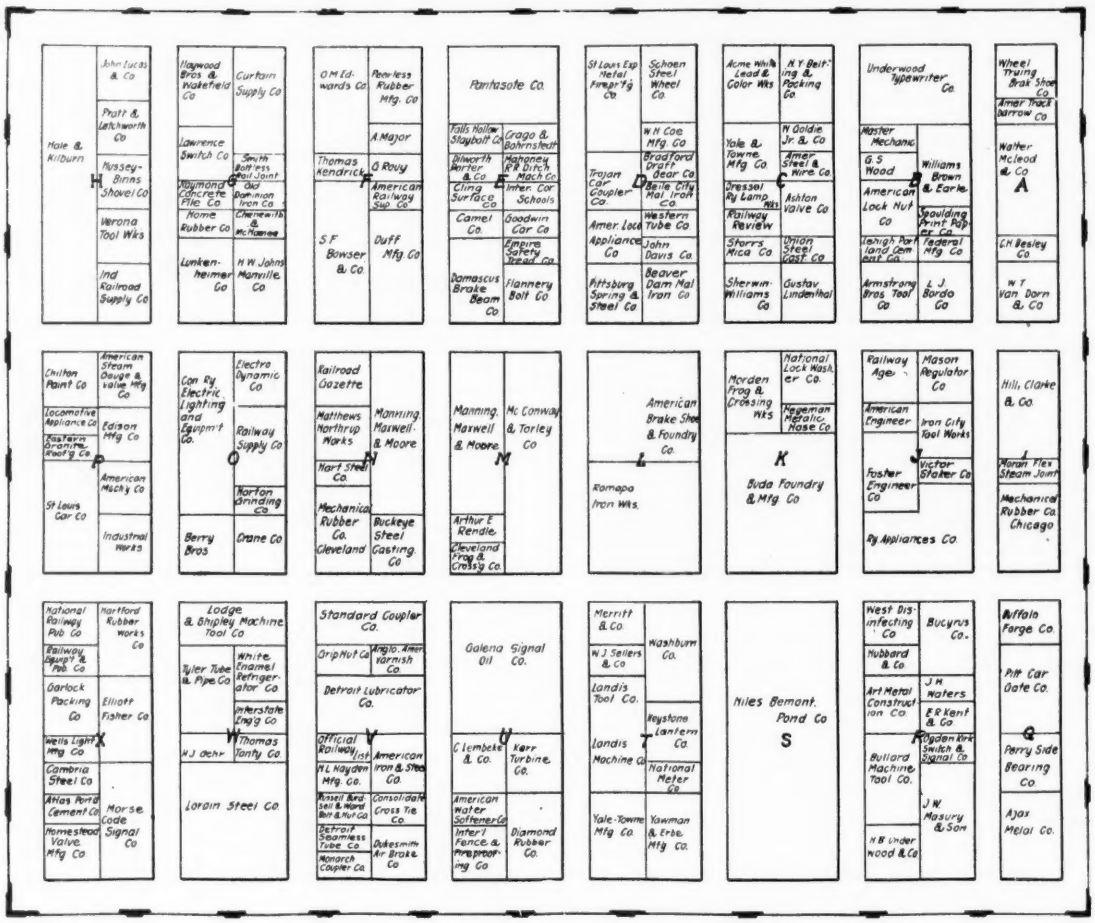
Atlas Portland Cement Company, New York, exhibited samples of the "Atlas" brand Portland cement.

James J. Wilson Manufacturing Company, New York, had an exhibit consisting of a booth entirely enclosed by the several different designs of rolling steel or wood doors and sliding freight-house doors. The large door in front, which was 18 ft. wide and weighs 1600 lbs., was of the interlooping steel variety, which can be raised by a 20-lb. pull. One of the end doors was a special design for engine houses, consisting of wooden strips threaded upon bronze straps and arranged for rolling up. These bronze straps are held taut by coiled springs in the base of the door which draws the wooden slats tight together and makes the door absolutely weatherproof.



THE WELLS LIGHT EXHIBIT.

THE WEBER RAILWAY JOINT MFG. CO.



LOCATION OF EXHIBITS IN THE MAIN BUILDING RAILWAY APPLIANCE EXHIBITION, WASHINGTON, D. C.

The Raymond Concrete Pile Company, Chicago, Ill., exhibited models of the steel core used in driving concrete piles, and also sections of the pile and photographs showing the operation of driving and a number of large installations recently completed.

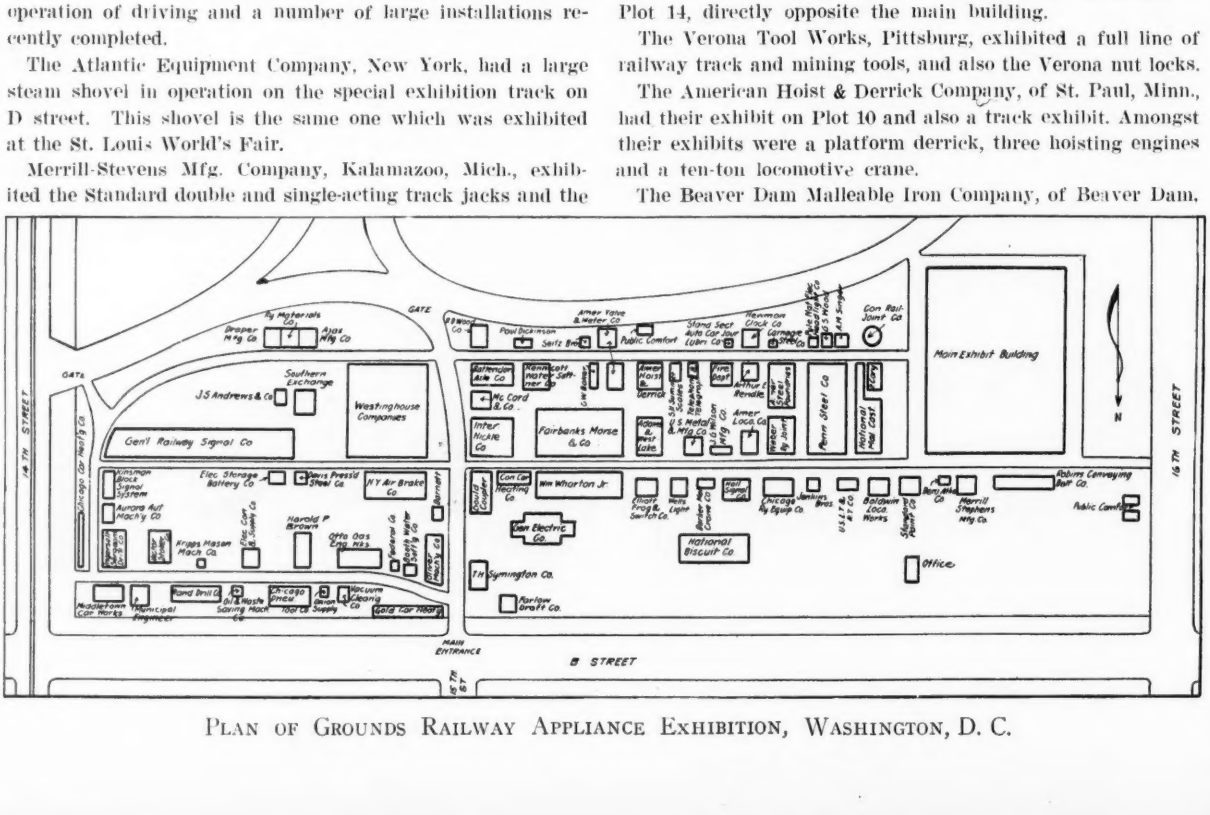
The Atlantic Equipment Company, New York, had a large steam shovel in operation on the special exhibition track on D street. This shovel is the same one which was exhibited at the St. Louis World's Fair.

Merrill-Stevens Mfg. Company, Kalamazoo, Mich., exhibited the Standard double and single-acting track jacks and the Standard car and bridge automatic lowering jacks in all sizes; also Cook's patent steel cattleguard and patent combination wood-steel cattleguard. This exhibit was located in Plot 14, directly opposite the main building.

The Verona Tool Works, Pittsburg, exhibited a full line of railway track and mining tools, and also the Verona nut locks.

The American Hoist & Derrick Company, of St. Paul, Minn., had their exhibit on Plot 10 and also a track exhibit. Amongst their exhibits were a platform derrick, three hoisting engines and a ten-ton locomotive crane.

The Beaver Dam Malleable Iron Company, of Beaver Dam,



PLAN OF GROUNDS RAILWAY APPLIANCE EXHIBITION, WASHINGTON, D. C.

Wis., were located in Section D. Their representatives, Messrs. D. O. Lamoroux, L. Fitch and A. Martin were there at all times to demonstrate their exhibit of tie plates, rail braces, anti-spreaders and anti-creepers. This exhibit was gotten up in a very attractive manner.

A large number of track barrows were exhibited in Section A by the American Trackbarrow Co., of Lowell, Mass.

Harold P. Brown, of New York, exhibited on Plot 4 electric rail bonds, rail drills, hand-power grinders instantaneous soldering and brazing process. They also had the Eccles & Smith steam and air hose couplings and electric testing bureau.

The Bucyrus Company, of South Milwaukee, Wis., were located in Section R. They had a fine line of photographs, blue prints, catalogues of wrecking cranes, steam shovels and pile drivers.

Cambria Steel Company, Johnstown, Pa., had their exhibit in Section X and also a track exhibit. They had for exhibition a flat drop-bottom gondola, 50-ton capacity and Coffin toughened axle, arch-bar trucks, 50-ton hopper car, 100 per cent rail joint, and 100 per cent insulated rail joint.

In Section G were located Chenoweth & McNamee, of Brooklyn, New York. Their exhibition consisted of sections of steel concrete pile and steel concrete column, fence post, steel concrete crossties, N. Y. C. & H. R. R. R. pattern, and steel concrete crosstie, Interborough Rapid Transit Subway pattern.

The Consolidated Crosstie Company of New York were located in Section V. They had samples of railroad crossties, treated by the Giussani process of wood preserving and samples of railroad crossties made by the Hege crosstie hewing machine.

Another exhibit of interest was that of the Dilworth, Porter & Company, of Pittsburg, Pa., in Section E. They had a very nice line of tieplates, spikes and tieplate machines.

The Eastern Granite Roofing Company, of New York, were located in Section P, where they showed samples of granite roofing, one sample of which had been exposed on a roof for 15 years.

Fairbanks, Morse & Co., of Chicago, Ill., had a very attractive exhibit on Plot 8. The exhibit included 12-horsepower gas engine direct to a four-kilowatt generator furnishing light for the building. Also 10-horsepower combined pump; 12-inch rigid and 10-inch flexible spout and pipes; large motor car operating on track and complete line of motor cars on floor; Shelfield hand cars, push cars and velocipedes, also 18-foot wind mill, duplex steam pump, Barrett jacks, dynamos and motors, rail benders, drill and air compressors.

On Plot 3 was the exhibit of the General Railway Signal Company, of Buffalo, New York. They showed electric mechanical and low pressure pneumatic interlocking, electric automatic block signals and manual controlled block signals.

William Goldie Co., Pittsburg, Pa., were located in Section C., where they exhibited rail and continuous base plate; section of 85-pound standard rail, with continuous base rail; section of 85-pound rail, new design, with thick and narrow base; section of 85-pound rail, double headed, with continuous base plate, and section of thick and narrow base rail with Goldie tieplate.

The Hall Signal Company, of New York, were located on Plot 11 with a full line of the latest improved electric motor signal, latest improved electro gas signal, latest improved staff signal apparatus, glass inclosed porcelain relays, Hall lightning arresters, new electro liquid slot signal (mechanical), disc signals and indicators and semaphore indicators.

In Section N was a very interesting exhibit of tieplates by the Hart Steel Company, of New York.

Hubbard & Company, of Pittsburg, Pa., in Section R., had a fine line of track tools.

The Hussey-Bemis Shovel Company, of Pittsburg, Pa., were located in Section H, with their telegraph shovels and spoons, railroad track shovels, contractors' shovels, locomotive scoops, coal scoops and shovels, ditching and drain spades and special round point shovels.

The Independent Railroad Supply Company, of Chicago, were located in Section H. They had on exhibition the Wolhaupter standard rail joints, Wolhaupter step joint, Wolhaupter "C" joint, Wolhaupter shoulder tieplate, Federal single flange tieplate and Chicago 4-flange tieplate.

A very interesting line of photographs of wrecking and locomotive cranes were in Section P, exhibited by the Industrial Works, Bay City, Michigan.

The Iron City Tool Works, Limited, of Pittsburg, Pa., showed a very fine line of railroad track tools and Eureka nut locks in Section J.

The Kinsman Block System Company, of New York, were located in Plot 4, where they exhibited in a very fine manner the Kinsman block system.

In Section G was a model of Lawrence safety rail switch, an exhibit of the Lawrence Switch Company, of Duluth, Mich.

The Lehigh Portland Cement Company, of Allertown, Pa., was located in Section B. Their exhibit consisted of cement mantel, ornamental plaques, etc., also some of the uses to which cement may be put.

The treating of crossties was demonstrated in Section U, by the C. Lembeke Company, of New York. They showed a number of crossties treated by the Rueping process.

The Lorain Steel Company, of Philadelphia, Pa., had their exhibit in Section W, where they exhibited samples of girder rails, tongues, switches, mates, frogs, street and steam crossings and electrically welded joints.

Walter McLeod & Company, of Cincinnati, O., had their exhibit in Section A. They exhibited flue furnaces and flue welder, locomotive tire expander, Buckeye lights and heaters, sand blasts, oil furnaces, lead melting machines and pneumatic sprayers.

In Section K was the exhibit of the Morden Frog & Crossing Works, Chicago, Ill. They had on exhibit Security switch stands, ground throw stands and photograph of continuous rail crossing.

The Odenkirk Switch & Signal Company, of Cleveland, O., had their exhibit in Section R, of the main building, where they showed the Odenkirk switch stand and signal and ball bearing railway car truck.

In Section O was an exhibit of crossing signals, station indicators, signals and tieplates of the Railway Supply Company, of Chicago.

The Robins Conveying Belt Company, Park Row Building, New York, were located on Plot 18. They had on exhibit working model of 16-inch conveyor, showing discharges, automatic reversible tripper and different angles of working.

A very interesting exhibit was that of the Rodger Ballast Car Company, Railway Exchange, Chicago, Ill., on a track near Twelfth street. They showed the class C. S. Hart convertible ballast and coal car.

The St. Louis Expanded Metal Fire Proofing Company, of St. Louis, Mo., had their exhibit in Section D. Their exhibit of Johnson corrugated bars for reinforced concrete, together with illuminated transparency, showed the application of reinforced concrete in railway structure.

The Southern Exchange Company, of 97 Warren street, New York, had an exhibit on Plot 3. They showed in a very attractive manner octagonal and square poles for telegraph and telephone use, cross arms and railway crossties.

The Union Switch & Signal Company, Swissdale, Pa., were located in the Westinghouse Building. They showed their all-electric interlocking systems, electric and electro-pneumatic block signals and high speed trained staff system in operation.

Personals

Mr. William F. Kimball has resigned as engineer of the Dunkirk, Allegheny Valley & Pittsburg.

Mr. H. H. Eggleston has been appointed supervisor of bridges and buildings of the Chicago & Alton at Bloomington, Ill., to succeed Mr. William Bowers, resigned.

Mr. H. S. Rogers has been appointed chief engineer of the Manistee & Grand Rapids, succeeding Mr. Aug. Fronhoefer.

Mr. R. G. Hengst has been appointed assistant chief engineer of the Western Allegheny at New Castle, Pa.

Mr. W. K. Walker has been appointed division engineer of the Misouri Pacific at Pueblo, Colo.

Mr. John Schimmel, Jr., has been appointed supervisor of the Pennsylvania at Olean, N. Y., succeeding Mr. N. F. Greene, transferred to Washington.

Mr. S. G. Swigart has been appointed assistant engineer in the construction department of the Cincinnati, Hamilton & Dayton, with headquarters at Dayton, O.

Mr. R. Dovel has been appointed roadmaster of the Norfolk & Western at Kenova, W. Va., to succeed Mr. H. T. Remicher, transferred.

Mr. John Ennis has been appointed supervisor of track of the New York Central & Hudson River at North Tonawanda, N. Y., to succeed Mr. Thomas Behan, who has been assigned to special work.

Mr. E. G. Tilton, formerly acting chief engineer of the San Pedro, Los Angeles & Salt Lake, has been appointed chief engineer.

Mr. George A. McCarthy has been appointed engineer maintenance of way and assistant to the chief engineer of the Temiskaming & Northern Ontario.

Mr. H. M. Nelson, formerly supervisor of bridges and buildings of the Chesapeake & Nashville, has been appointed superintendent of bridges and buildings of the Denver, Enid & Gulf, with headquarters at Enid, Okla.

Mr. L. P. Atwood, engineer maintenance of way of the Chicago, Peoria & St. Louis, has also been appointed engineer maintenance of way of the Litchfield & Madison, with headquarters at Alton, Ill.

Mr. J. T. Denithorne has been appointed engineer of the Valley division of the St. Louis, Iron Mountain & Southern and of the Mississippi River, Hamburg & Western, with headquarters at McGehee, Ark.

Mr. O. F. Barnes, formerly general roadmaster of the Pittsburg, Shawmut & Northern, has been appointed division engineer of the Rochester division of the Erie, with headquarters at Rochester, N. Y.

Mr. I. L. Thomas, roadmaster of the Missouri, Kansas & Texas at Denison, Tex., has been appointed roadmaster at Smithville, Tex., in place of Mr. E. J. Bohanon, resigned. Mr. Thomas is succeeded at Denison by Mr. A. C. Hinckley.

Mr. J. P. Hallihan has been appointed chief engineer and assistant to the president of the Rio Grande, Sierre Madre & Pacific, with headquarters at El Paso, Tex.

The office of Mr. W. M. Duane, superintendent of construction of the Cleveland, Cincinnati, Chicago & St. Louis, has been moved from Mattoon, Ill., to Cincinnati, O.

Mr C. E. Drummond has been appointed assistant engineer of the Oregon Short Line and has been placed in charge of the work of construction of the Malad Valley branch.

Mr. Earl Stimson, division engineer of maintenance of way of the Baltimore & Ohio Southwestern at Washington, Ind., has been appointed engineer of maintenance of way of Cincinnati, O., and is succeeded at Washington by Mr. Thayer, who has been assistant engineer of the Ohio division.

Mr. George W. Boshke has been appointed chief engineer of the Oregon Railroad & Navigation Company and the Southern Pacific lines in Oregon with headquarters at Portland, Ore., to succeed Mr. W. H. Kenneday, resigned on account of ill health.

Mr. W. C. Taylor, division engineer of the Kansas division of the Chicago, Rock Island & Pacific, has been appointed division engineer of the El Paso division, with headquarters at Dalhart, Tex., and Mr. W. A. Van Frank has been appointed to succeed Mr. Taylor on the Kansas division, with headquarters at Topeka, Kan. Mr. C. M. Case, division engineer of the El Paso division, has been appointed engineer of the Missouri division, with headquarters at Trenton, Mo., in place of Mr. Van Frank.

Mr. Thomas Bernard, who has been superintendent of maintenance of way of the western district of the Southern Railway, has been appointed to a similar position on the eastern division. Mr. P. S. Fitzgerald, formerly Mr. Bernard's assistant, has been appointed superintendent of the western division.

Mr. E. R. Taft has been appointed engineer of construction of the Great Northern, with headquarters at St. Paul, Minn. Mr. F. B. Walker has been apnointed resident engineer at Superior, Wis., vice Mr. Taft. Mr. G. A. Casseday has been appointed bridge engineer, with headquarters at St. Paul, Minn. Mr. Samuel L. Bartlett has been appointed architect, with headquarters at St. Paul.

Mr. E. M. Grime, formerly assistant engineer of the Chicago Great Western at St. Paul, Minn., has been appointed division engineer of the Ft. Dodge division at Clarion, Ia. Mr. W. C. Harvey, division engineer of the Ft. Dodge division, has been appointed principal assistant engineer, with headquarters at St. Paul, succeeding Mr. E. C. Macy, resigned.

Mr. W. H. Knowlton, principal assistant engineer of the New York Central & Hudson River at Syracuse, N. Y., has been transferred to New York to assist Vice-President Wilgus in the work of electrification. Mr. C. J. Parker, principal assistant engineer at New York, will hereafter devote his attention to the branches north and west of Croton. Mr. J. W. Eber, division engineer at Watertown, N. Y., has been transferred to New York and made assistant to Engineer of Maintenance of Way Hardin, and is succeeded as division engineer at Watertown by Mr. W. Klufeld, Jr., formerly superintendent of bridges of the Mohawk division at Utica, N. Y.

The following appointments have been announced on the Baltimore & Ohio Railroad: Mr. J. B. Dickson is appointed chief engineer maintenance of way, with headquarters at Baltimore, Md.; Mr. J. A. Spielmann is appointed engineer maintenance of way of the Wheeling System, with headquarters at Wheeling, W. Va.; Mr. H. E. Hale is appointed engineer maintenance of way of the main line system, with headquarters at Baltimore, Md.; Mr. V. K. Hendricks is appointed division engineer, vice Mr. Hale, promoted; Mr. H. H. Temple is appointed engineer maintenance of way of the Pittsburg System, with headquarters at Pittsburg, Pa.; Mr. L. P. Rossiter is appointed division engineer, vice Mr. Temple, promoted; Mr. F. J. Batchelder is appointed assistant division engineer, vice Mr. Rossiter, promoted.

Rodger Ballast Hart Convertible Car

Among the many problems confronting railway officials the question of the reduction of expenses of construction, maintenance and operation of railways is an all important consideration. Among the devices brought out for labor saving is the Rodger ballast Hart convertible car. These cars are so constructed that they can be used in many different kinds of service, viz: As a center-dump self-clearing ballast car, which distributes ballast just where needed in center of track and can be regulated so as to discharge as little or as much material at any point as may be desired; second, as a side-dump

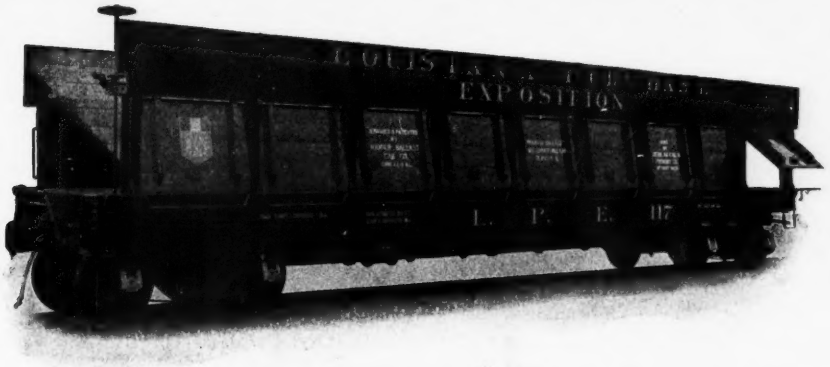


FIG. 1—SIDE ELEVATION, RODGER BALLAST HART CONVERTIBLE CAR.

construction car for use in connection with a top plow and Lidgerwood unloader. Third, as a center-dump self-clearing hopper car for hauling coal or like material. Fourth, as a flat-bottom side-dump gondola they can be used same as any ordinary gondola can be used, with the advantage of having the sides composed of a series of swinging doors for discharging material through them if desired.

By using this style car for disrtibuting ballast in the center of the track instead of on the side, a great saving can be accomplished. With this system ballast can be deposited at the rate of 30 yards per minute, and it is possible to place from 1000 to 1200 cubic yards per mile into the track with the first run of ballast. If more than this is required it is only necessary to go over the ground a second time.

The ease and simplicity with which these cars can be converted from a center dump ballast to a side dump construction or gondola car appeals to all practical railroad men. Four men with a monkey wrench and pinch bar can convert one of the cars from one position to another in ten to twenty minutes, thus insuring having cars always available for construction work, ballasting or general freight service.

The service required of construction and ballast cars is exceptionally severe and cars must be well built to stand the strain. The cars have a most substantial construction possible and have proven their staying qualities. They are built of either wood or steel or steel underframe with wooden body, to M. C. B. standards and of 60,000, 80,000 or 100,000 pounds capacity.

These cars are not an experiment, as the convertible car has been in successful operation for the last four years on many of the leading railroads, as well as interurban railways. During this time they have been subject to exceptionally hard conditions, which has enabled the manufacturers, the Rodger Ballast Car Co., Railway Exchange Building, Chicago, to make many improvements tending to strengthen their construction. The manufacturers are always glad to give investigators who seek information very facility possible and will cheerfully furnish any additional information.

New Railway Signal Device

The United States Consul Worman, Three Rivers, Canada, reports a Canadian invention for signaling with electric lights which was put to a practical test at Montreal, in the presence of experts from the leading railway companies.

The apparatus was fitted up to represent five stations of a railway line, each station having a switchboard with two lamps, a bell, and four switches. The two outer switches are for turning on the lights when a signal is to be given along the line, either to the left or right of the signaling station, or in both directions. One of the inner switches is for turning on the current when the officials of the station are leaving

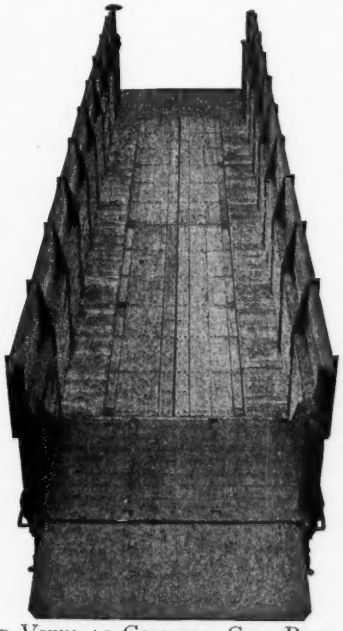


FIG. 2—TOP VIEW AS GONDOLA CAR, RODGER BALLAST HART CONVERTIBLE CAR.

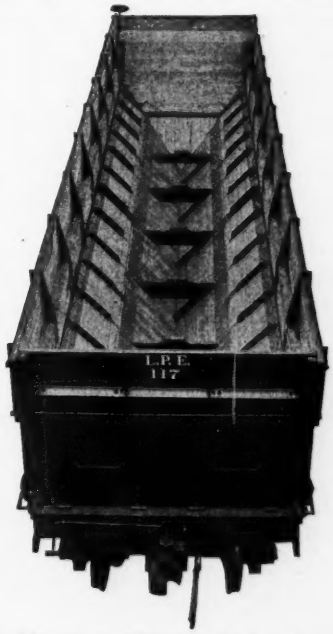


FIG. 3—TOP VIEW AS HOPPER CAR, RODGER BALLAST HART CONVERTIBLE CAR.

for the night, so that there can be no interruption of signals between the other stations.

In case the night switch is not put on, the next calling station is advised by telegraph of the departure or arrival of a train in the usual way, and accidents can be thus prevented. As the signal lights can not be turned on beyond the negligent night station, which is intermediate, the calling station will be able to turn on the signals from this point "backward" to the night station, and thus insure the continuity of signals from one station to the other

The signal lights are supposed to be placed on every other telegraph post on the line, each being fitted with a plug, so that if, after leaving a station, there is a breakdown, the engineer need only insert the plug in the slot and he advises both stations of the mishap, and then, by the use of a code, he tells what the mishap is and what he requires.

If there is any train on the line which is not "on time," all other trains, by a regular succession of signals, can be warned of it. Power can be obtained from any point for use on the system, and short-circuiting is prevented by the use of three wires. The cost of installation is computed to be about $300 per mile.

Last month the Great Northern Ry. had in operation, between Seattle and Everett, Wash., two hydraulic plants clearing away slides. Each of these plants consisted of a 16x12-in. steam pump, mounted on a flat car and equipped with 8-in. suction hose and 6-in. discharge hose, with nozzles varying from 1½ to 2½ inches. The pumps work at about 120 strokes per minute and about 400 lbs. of coal per hour were required to generate the steam. Each plant is worked by a foreman, engineer and seven laborers, and removes an average of 300 cu. yds. of material per day.

The city council of Chicago has passed an ordinance, submitted by the track elevation committee, providing for the elevation of tracks and the elimination of 66 grade crossings with streets. Most of these grade crossings are in South Chicago. The following roads are affected by the ordinance: Pittsburg, Fort Wayne & Chicago; South Chicago & Southern; Lake Shore & Michigan Southern; Baltimore & Ohio; South Chicago R. R.; Chicago & Western Indiana; Chicago, Rock Island & Pacific, and Lake Shore & Eastern. The estimated cost of the improvements is $4,000,000.

The Pennsylvania Railroad is considering the advisability of widening the old tunnel at Gallitzin, Pa. It is now so narrow that a man cannot stand between the tracks when trains are moving, and the engineering department has suggested that it be made about four feet wider. This work would take some time, and is contingent upon the success attending the operation of the ventilating apparatus in the new tunnel. The latter would have to take care of all traffic, while the old tunnel is being widened, and could not do so unless the ventilation scheme proves satisfactory.

It is said that an eastern railroad has introduced a system of protecting smooth steel surfaces in its stations with painter paper. Of all the paints tried none was found which could be relied upon to protect a clean steel surface more than eight months under the extremely severe conditions of the test. Under the new system the metal is cleaned in the ordinary way and then coated with a single coat of a sticky substance. Paraffined paper is next pasted over this and finally painted any color desired. Holes are cut in the paper for the rivet heads to pass through, the heads being then covered with caps of paraffined paper. The cost is but little more than that for applying two coats of litharge in boiled linseed oil directly to the metal and the result appears to be permanent.

A business meeting of the Engineers' Club of Philadelphia will be held on Saturday evening, June 3. There will be a paper entitled, "A Simplex System of Concrete Piling," by Mr. Constantine Shuman. The paper will be illustrated by lantern slides. The "angleometer," an instrument to supersede the sextant, will be shown and a demonstration made by Dr. Henry E. Wetherill. A regular meeting of the club was held on May 20, 80 members and visitors being present. Mr. F. Herbert Snow, of Boston, presented a paper on "The Bacteriological Treatment of Sewage," in which he outlined the development of the method and finally illustrated the latest methods as adopted in several recently constructed systems. The paper was then discussed by Mr. Kenneth Allen of Atlantic City, Dr. James of Baltimore, Mr. Garrison of Vineland, N. J., and Mr. Maignen, member of the club; the discussion being closed by Mr. Snow.

Tensile Impact Tests of Metal, by W. Kendrick Hatt. Authorized reprint from the American Society of Testing Materials. This has fifteen illustrations of tests and curves of results, together with twelve tables and 34 pages of reading matter. Very extensive results are given of tests of metal in tensile impact loads as carried on at Purdue University.

Technical Publications

Proceedings of the Fourteenth Annual Convention of the Association of Railway Superintendents of Bridges and Buildings, October 18-20, 1904. Contents are "Cleanliness of Station Grounds and Buildings," "The Evolution of Railroad Bridge Building," "Should Ties of Bridges be Gained so as to Leave Rail Without Camber, or Should Only a Portion of the Camber be Taken Out?" "What is the Best Form of Traveler to Use in Erecting Steel Railway Bridges of Spans up to 200 Feet?" "What has been the Experience in the Use of Concrete Under Bridge Bed Plates and Turn-Tables in Place of Pedestal Stones, and What is the Best Form of Material for Bed Plates Under Various Styles of Iron Bridges?" "Best Methods of Caring for Trestles While being Filled," "Best Form of Construction for Engine Houses," "Best Method of Filling Ice Houses and Conveying Ice to Refrigerator Cars," "Best Method of Filling Track Water Tanks Automatically," "Steam Hammers vs. Drop Hammers for Pile Drivers," "Best Record Forms for Buildings, Water Tanks, etc.," "Best Freight and Roundhouse Doors and Fittings for Same," "Best Method for Preserving Timber and Piles in Structures," "Best Method of Protecting Low Overhead Structures over Tracks from Gases and Blasts of Locomotives."

Earth and Rock Excavations.—A practical treatise with illustrations, by Charles Prelini, C. E. Bound in cloth, 354 pages. Published by D. Van Nostrand Co., New York. Price, $3.00. This book supplies a want for literature treating with earth and rock excavation in a concise and comprehensive manner, having regard for both the planning and computation of such work and for the methods and machines by which it is accomplished. It concentrates in a small volume descriptions of the different operations which are required for planning and executing any work of excavation in either earth or rock; it classifies and describes clearly the various implements and machines used for excavating and hauling away the material. The contents of the book comprise first a discussion of the graphical representation and calculation of earth work. This section is followed by chapters describing the construction and operation of the various machines used for excavating and transporting earth and rock. Succeeding chapters consider the various methods of planning and executing works of excavation; and describe methods for deducing the cost of such work in any particular case. A concluding section describes briefly a number of large works of excavation.